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10/001,553	10/31/2001	Che-Bin Liu	2000P09023US01	7750

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EXAMINER	
LEFLORE, LAUREL E	
ART UNIT	**PAPER NUMBER**
2673	6

DATE MAILED: 12/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/001,553	LIU ET AL.	
	Examiner	Art Unit	
	Laurel E LeFlore	2673	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-20 and 22-25* is/are pending in the application.

4a) Of the above claim(s) *4, 21* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-14,17-20 and 22-25* is/are rejected.

7)☒ Claim(s) *15, 16* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 October 0203* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

1. The drawings were received on 27 October 1003. These drawings are accepted. Formal drawings should be submitted.

Claim Rejections - 35 USC § 102

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. Claims 9, 10, 13 and 17 are rejected under 35 U.S.C. 102(e) as being anticipated by Iwamura 6,501,515 B1.

In regard to claims 9, 10, 13 and 17, see paper 4, 102(e) rejection of claims 9, 10, 13 and 17. It is noted that applicant indicated on page 11, first paragraph, of the response that claim 9 is a dependent claim. However, claim 9 is actually an independent claim.

Allowable Subject Matter

4. The indicated allowability of claims 4, 6, 7, 11, 12, 14, 21, 23 and 24 is withdrawn in view of the newly discovered reference(s) to Funayama et al. 6,332,038 B1. Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
6. Claims 1-3, 8, 9, 18-20 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Qiao 6,075,895 in view of Funayama et al. 6,332,038 B1.

In regard to claims 1 and 18, Qiao discloses an invention similar to that which is claimed in claims 1 and 18. See paper 4, 102 rejection of claims 1 and 18 for similarities. Qiao does not disclose that determining the object in the image comprises the steps of obtaining a normalized color representation for a plurality of colors in each image, determining from training images an estimate of a probability distribution of normalized color values for an object class, and determining, for each pixel, a likelihood according to an estimated probability density of normalized color values for the object class.

Funayama et al. discloses an image processing device that detects an object in an image. See column 2, lines 15-18, disclosing, "For example, when the foregoing specified object domain is a human face, by using a probability density function derived from a color distribution of human faces, skin areas of faces can be separated from the base image." Thus, Funayama et al. determines from training images an estimate of a probability distribution of color values for an object class and determines a likelihood according to an estimated probability density of color values for the object class. See column 14, lines 57-59, disclosing that "the separability measurement process was carried out for...all pixels of the base image"; thus, the likelihood is determined for each pixel. See column 13, line 44, disclosing that "separability is a normalized quantity". It is understood that the color values are normalized, as normalization is conventional and necessary in order to compare images.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Qiao by determining an object on the image by obtaining a normalized color representation for a plurality of colors in each image, determining from training images an estimate of a probability distribution of normalized color values for an object class, and determining, for each pixel, a likelihood according to an estimated probability density of normalized color values for the object class. One would have been motivated to make such a modification based on the teaching of Funayama et al. to use a probability density function derived from a color distribution of the object class in order to separate an object from an image, thereby determining an object in the image. Also, the normalization of color values is conventional and necessary in order to compare images for any purpose, including object determination.

7. In regard to claims 2, 3, 8, 9, 19, 20 and 25, see paper 4, 102 rejection of claims 2, 3, 8, 9, 19, 20 and 25.

8. Claims 5 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Qiao 6,075,895 in view of Funayama et al. 6,332,038 B1 in further view of Iwamura 6,501,515 B1.

   In regard to claims 5 and 22, see paper 4, 103 rejection of claims 5 and 22.

9. Claims 6, 7, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Qiao 6,075,895 in view of Funayama et al. 6,332,038 B1 as applied to claims 1 and 18 above, and further in view of Prasad et al. 5,680,481.

In regard to claims 6 and 23, Qiao in view of Funayama et al. discloses an invention similar to that which is claimed in claim 6. See rejection of claims 1 and 18 for similarities. Qiao in view of Funayama et al. does not disclose that determining the trajectory comprises the steps of: determining a difference in a size of the object over a predetermined time period; determining a plurality of angles between a plurality of lines connecting successive centroids over the time period; and determining a feature vector according to the angles and lines.

Prasad et al. Discloses in column 5, lines 60-64, "The first normalization step provided a set of facial measurements characteristic of the size of each speaker's face by averaging the vectors corresponding to all rested position times." Thus, Prasad et al. determines a difference in a size of the object over a pre-determined time period.

Prasad et al. further discloses determining a plurality of angles between a plurality of lines connecting successive centroids over the time period. See figure 4. Also see column 8, lines 60-65, describing lines and angles connecting eye centroids and column 9, lines 28-31 disclosing lines and angles associated with a mouth area centroid. Further see column 4, lines 60-62, disclosing, "The centroids of each marker are tagged and linked from frame-to-frame to form a trajectory."

Prasad et al. further discloses that the angles and lines connecting centroids determine a feature vector. The angles and lines are used to form a region of interest (ROI) coordinate system (see column 9, lines 36-41) and from

this, a feature vector is formed. (see figures 6-8 and column 10, lines 16-55, disclosing how the centroid connecting lines and angles are mapped to coordinate systems to extract peaks and valleys used to make up a visual feature vector." See column 10, lines 61-63, disclosing, "additional feature vector elements were created from the frame-to-frame (image-to-image) observations". Thus, the feature vector elements were formed from centroid-connecting lines and angles over time.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Qiao in view of Funayama et al. by determining a trajectory with the steps of: determining a difference in a size of the object over a predetermined time period; determining a plurality of angles between a plurality of lines connecting successive centroids over the time period; and determining a feature vector according to the angles and lines. One would have been motivated to make such a change based on the teachings of Prasad et al. to form a feature vector by calculating angles and lines connecting an object's centroids over time, and in order to form a feature vector "suitable for processing by a...classifier" from a data set.

10. In regard to claims 7 and 24, Qiao in view of Funayama et al. further in view of Prasad et al. discloses an invention similar to that which is disclosed in claims 7 and 24. See rejection of claims 1, 18, 6 and 23 for similarities. Qiao in view of Funayama et al. does not disclose that classifying the trajectory further

comprises the step of classifying the feature vector according to a time-delay neural network, wherein a feature is of a fixed length.

See Prasad et al., column 10, line 60 to column 11, line 16, describing the elements of the visual feature vector and disclosing that the "resulting visual feature vector includes 22 elements which are used as the visual data vector input to a TDNN [time delay neural network] speech classifier as shown in FIG. 10." Note elements 3), 5), and 6) of the feature vector, which involve calculations based on a change in time. Thus, a feature is of a fixed length.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Qiao in view of Funayama et al. by classifying the feature vector according to a time-delay neural network, wherein a feature is of a fixed length. One would have been motivated to make such a change based on the teaching of Prasad et al. that, "In order to accommodate utterances that may be of variable length, as well as somewhat unpredictable in the time of utterance onset, the neural network employed...was chosen to be a time delay neural network (TDNN)". Because of this teaching, one would have been motivated to use a time delay neural network in any type of motion tracking, as motion of objects "may be of variable length, as well as somewhat unpredictable in the time of...onset".

11. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamura 6,501,515 B1 in view of Jeannin 6,587,574 B1.

In regard to claim 11, Iwamura discloses an invention similar to that which is claimed in claim 11. See paper 4, 102 rejection of claim 9 for similarities. Iwamura does not disclose that the reference point (hand) is characterized by size and location of a centroid of the reference point (hand) in each image.

Jeannin discloses in column 8, lines 30-34 that, "Each object's centroid provides a single reference point within each frame that is used to analyze the object's movement. The trajectory of the object's centroid is the basis for describing the motion or trajectory of the object from frame 201 to frame 204 [see figure 2]." Thus, the reference point is characterized by location of a centroid of an object in each image. Jeannin further discloses in column 12, lines 57-59, that "z information may be deduced from the size variation of the object between consecutive frames." Thus, a reference size is inherent, and an object's reference point is characterized by size of the object.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Iwamura by having the reference point characterized by hand size and a location of a centroid of the hand in each image. One would have been motivated to make such a change based on the teaching of Jeannin to use an object's centroid as a single reference point to analyze the object's movement within each frame and to use change in the object's size to determine z information size.

12. In regard to claim 12, Iwamura discloses an invention similar to that which is disclosed in claim 12. See paper 4 102 rejection of claim 9 for similarities.

Iwamura does not disclose that the first translation is one of a forward and a backward translation, wherein the first translation is characterized by a large change in hand size and a relatively small change in a centroid of the hand.

Jeannin discloses in column 12, lines 52-54, that, "The speed or velocity of the object for each time instant may be calculated as the local first order derivative of the centroid position, normalized by the image size." Also, see 103 rejection of claim 11 disclosing that Jeannin uses object size and centroid location to classify trajectory information, in the z direction in particular. Thus, any forward and backward translation (z direction translation) is characterized by object size and centroid location. It is inherent that for z direction translation, this would be a large change in hand size and a relatively small change in centroid location of the object. This could be the first or any translation in the object's trajectory.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Iwamura by having the first translation be one of a forward and a backward translation, wherein the first translation is characterized by a large change in hand size and a relatively small change in a centroid of the hand. One would have been motivated to make such a change based on the teaching of Jeannin to use the location of an object's centroid as a reference and to deduce z information from an object's size. Thus, the first or any translation in a z (forward or backward) direction could be identified.

13. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamura 6,501,515 B1 in view of Prasad et al. 5,680,481.

In regard to claim 14, Iwamura discloses an invention similar to that which is disclosed in claim13. See paper 4, 102 rejection of claim 9 for similarities. Iwamura does not disclose that detecting the second translation further comprises the step of determining a normalized vector between two centroids c.sub.t and c.sub.t-1 as a feature vector, wherein there are three output patterns.

Prasad et al. discloses determining a plurality of angles between a plurality of lines connecting successive centroids over the time period. See figure 4. Also see column 8, lines 60-65, describing lines and angles connecting eye centroids and column 9, lines 28-31 disclosing lines and angles associated with a mouth area centroid. Further see column 4, lines 60-62, disclosing, "The centroids of each marker are tagged and linked from frame-to-frame to form a trajectory." Prasad et al. discloses that the angles and lines connecting centroids determine a feature vector. The angles and lines are used to form a region of interest (ROI) coordinate system (see column 9, lines 36-41) and from this, a feature vector is formed. (see figures 6-8 and column 10, lines 16-55, disclosing how the centroid connecting lines and angles are mapped to coordinate systems to extract peaks and valleys used to make up a visual feature vector." Thus a normalized vector is formed between centroids. See column 10, lines 61-63, disclosing, "additional feature vector elements were created from the frame-to-frame (image-to-image) observations". Thus, the feature vector elements were

formed from centroid-connecting lines and angles over time, and the normalized vector is formed between two centroids in time. As the feature vector is mapped to a TDNN (see rejection of claims 7 and 24), for speech recognition, it is inherent that there are at least three output patterns.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Iwamura by detecting the second, or any, translation by determining a normalized vector between two centroids c.sub.t and c.sub.t-1 as a feature vector, wherein there are three output patterns. One would have been motivated to make such a modification based on the teaching of Prasad et al. to form a feature vector from centroids throughout time to recognize speech and because such a tracking of trajectory could be used to recognize any form of motion.

Allowable Subject Matter

14. Claims 15 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Smith et al. 6,128,003 discloses a hand gesture recognition system and method which includes calculation of rotational vectors using hand centroid locations.

Stork et al. 5,771,306 discloses a method for speech recognition using centroid tracking.

Dakss et al. 6,642,940 B1 discloses a method for object identification that uses probability density distributions of pixel color values.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Laurel E LeFlore whose telephone number is (703) 305-8627. The examiner can normally be reached on Monday-Friday 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on (703) 305-3885. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

LEL

JOSEPH MANCUSO
PRIMARY EXAMINER